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GB 1128778

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GB 1033152

GB 1016012

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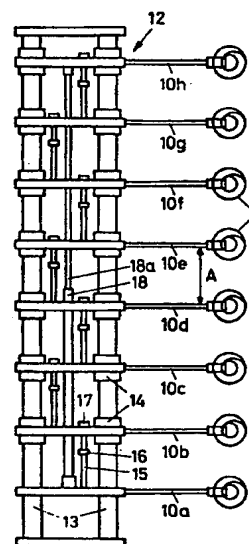
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(54) Load handling device for varying the spacing of engaged articles

(57) Apparatus for feeding a plurality of wire springs to a spring core assembling machine, includes a device for varying the mutual spacing of the wire springs in order to produce spring cores of varying width and having various spring properties. The apparatus comprises gripper arms (10a to 10h) for holding the springs (4) the gripper arms being mounted side by side on a gripper beam (12). The first gripper arm (10a) is fixedly connected to the gripper beam (12) while all the other gripper arms (10b to 10h) are mounted in a laterally movable manner on the gripper beam (12), the gripper arm (10h) furthest from the first gripper arm (10a) being connected to a drive member (18,

18a) which permits movement of the latter gripper arm (10h) on the gripper beam (12). Each gripper arm is releasably connected to the adjacent gripper arm by means of a distance limiting member (15) with two end stops (16, 17), so that anyone gripper arm (e.g. 10d) can be adjusted to two different spacings (A), limited by the end stops (16, 17) relative to the adjacent gripper arm, (e.g. 10e).

Fig. 3



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Fig. 1

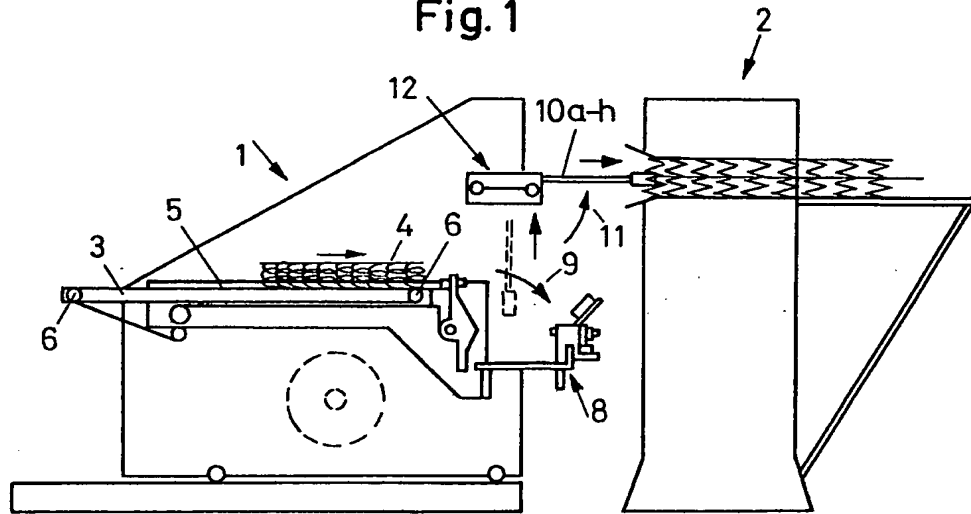


Fig. 2

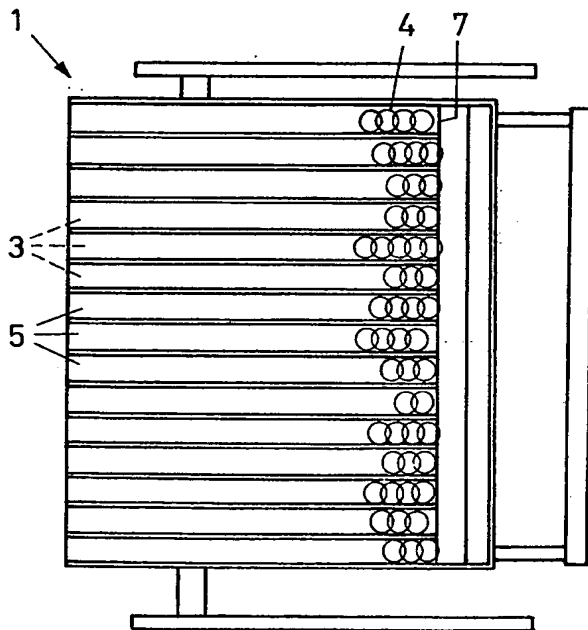


Fig. 3

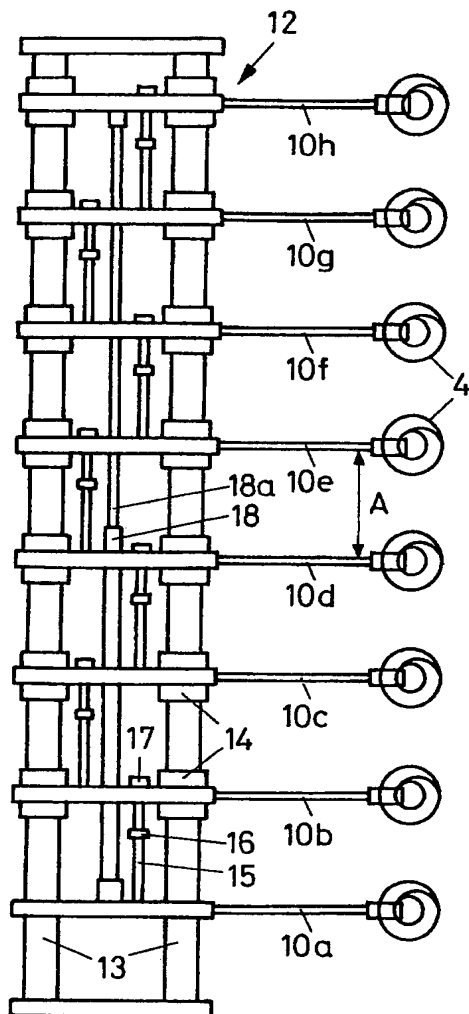


Fig. 4

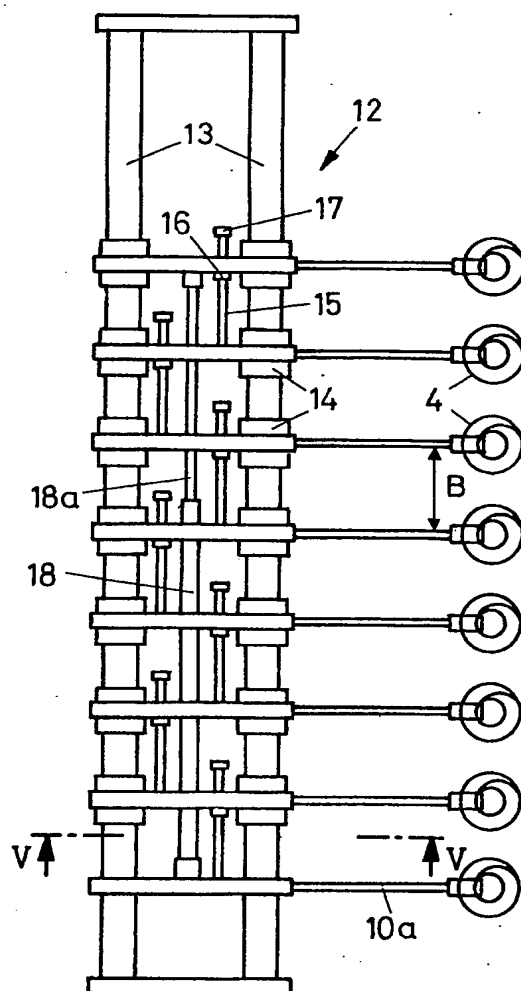
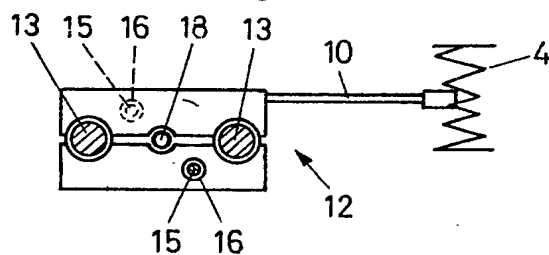


Fig. 5



## SPECIFICATION

**Apparatus for feeding a plurality of wire springs to a spring core assembling machine**

The present invention relates to an apparatus of the kind which feeds a plurality of wire springs arranged in a row to a spring core assembling machine, with a device for varying the mutual spacings of the wire springs, the latter being held by gripping arms which are mounted side by side on a gripper beam.

Apparatus of this kind are already known, for example, from DE-OS 1 752 815 and United States Patent Specification 3,193,136. The Applicants German Patent Application No. P28 36 138.8 relates to a feeding apparatus of this kind, wherein helical springs in parallel sliding guides are moved towards a stop. In this case, the foremost springs are each gripped by a gripping arm and fed to the spring core assembling machine. As the spacings of the parallel slide guides are not variable, it is only possible to produce spring cores wherein the springs are at the same spacing as the slide guides of the feeding apparatus.

In order to be able to produce spring cores of varying width and having various spring properties, it is desirable if the springs can be fed to the assembling machine by the known feeding apparatus at spacings which can be adjusted as required.

A feed apparatus is known from United States Patent Specification No. 3,774,652 wherein the spacings of the springs in a row on a conveyor belt can be adjusted by means of electromagnetically controlled stops. However, this apparatus can only operate stepwise and very slowly, as one spring has to be fed in after another and the stops also act one after another. In addition, changing the spacings of the springs is a very time-consuming operation as the electromagnets have to be individually released, moved and refastened.

The aim of the invention is to construct a feeding apparatus of the kind described hereinbefore in which the spacings of a whole row of springs can be varied simultaneously and very quickly before the springs are fed into the assembling machine, and wherein the adjustment of the required spacings can also be carried out simply.

Accordingly to the present invention, there is provided apparatus for feeding a plurality of wire springs arranged in a row to a spring core assembling machine, with a device for varying the mutual spacings of the wire springs, the springs being held by gripper arms which are mounted side by side on a gripper beam, in which a first gripper arm is fixedly connected to the gripper beam while all the other gripper arms are mounted in a laterally movable manner on the gripper

beam, the gripper arm furthest from the first gripper arm being connected to a drive member which permits movement of the latter gripper arm on the gripper beam, and wherein each gripper arm is releasably connected to the adjacent gripper arm by means of a distance limiting member with two end stops, so that any one gripper arm can be adjusted to two different spacings, limited by the end stops, relative to the adjacent gripper arm.

Appropriately, a double acting lifting cylinder is provided as the drive means, which connects the fixed gripper arm to the gripper arm furthest from it.

The spacings of the individual springs can be varied as desired by simply adjusting the abovementioned end stops.

An embodiment of an apparatus according to the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic side view of a feeding apparatus for separating the helical springs and the spring core assembling machine co-operating therewith,

Figure 2 is a plan view of the feeding apparatus according to Fig. 1, but with the spring core assembling machine omitted,

Figure 3 is a plan view of the gripper beam with a row of springs on a larger scale, these springs still being at the spacings with which they were taken from the feeding apparatus,

Figure 4 is a plan view of the gripper beam with a different spacing of the springs before they are fed into the assembling machine and

Figure 5 is a section taken on the line V-V in Fig. 4.

In Fig. 1, reference numeral 1 denotes the feeding apparatus, 2 the spring core assembling machine which is known *per se*. The feeding apparatus comprises a row of parallel slide guides 3 for springs 4; these springs are, for example, placed by hand in upright bundles and engaging with one another between the guides 3.

The springs are constructed in known manner with their terminal coils linked to the penultimate coil by means of a knot. Between the guides 3 are mounted conveyor belts 5, which are driven in known manner, and which rotate about guide rollers 6 and move the bundles of springs towards a stop 7 (Fig. 2). Reference numeral 8 denotes the separating mechanism, which is not part of the invention. This mechanism grips the foremost springs 4 abutting on the stop 7 and rotates them through 90° in the direction of the arrow 9. The springs are then gripped by the gripper arms 10a to 10h, then raised and pivoted up into the upright position as indicated by arrow 11. Before the row of springs is fed into the assembling machine the spacings of the springs 4 or of their gripper arms 10a to 10h are changed.

For this purpose, the gripper arms 10a to

10h are mounted on a gripper beam 12. This is shown on a larger scale in Figs. 3, 4 and 5.

The gripper beam 12 comprises two struts 13. The outermost gripper arm 10a is rigidly connected to these struts. All the other gripper arms 10b to 10h are fixed on mountings 14 which are laterally movable on the struts 13. A bolt 15 acting as a distance limiting member is rigidly connected to each gripper arm 10a to 10h. Each bolt 15 passes, with some play, through a bore in the adjacent gripper arm (Fig. 5). Only the fixed gripper arm 10a does not have a bolt 15 passing through it. Each bolt 15 has two end stops 16 and 17 which are located one on either side of each gripper arm 10b to 10h having a bolt passing through it. The bolts 15 are constructed for example as threaded bolts and lock nuts serve as the end stops 16, 17.

Because of the mobility of the gripper arms 10b to 10h, these arms can be moved, within the limits defined by the end stops 16, 17, so that the spacings A between the individual gripper arms in Fig. 3 are reduced to the spacings B in Fig. 4.

To enable this movement of the gripper arms 10b to 10h to be performed automatically, a pneumatically or hydraulically actuated double-acting lifting cylinder 18 is attached to the fixed gripper arm 10a. Its piston rod 18a is connected to the gripper arm 10h at the other end of the gripper beam 12. The gripper arms 10b to 10g are penetrated by the lifting cylinder 18 or piston rod 18a without making contact therewith. Thus, by supplying pressure medium to one or other end of the piston (not shown) in the lifting cylinder 18, the gripper arms 10a to 10h can be moved from the spacings A shown in Fig. 3 to the spacings B shown in Fig. 4 and *vice versa*. At the spacings B shown in Fig. 4, the springs 4 are then fed into the assembling machine 2 (Fig. 1).

The spacings can be varied by simply adjusting the end stops 16 or 17.

Instead of the lifting cylinder 18, another known drive means for the gripper arm 10h could also be provided.

## 50 CLAIMS

1. Apparatus for feeding a plurality of wire springs arranged in a row to spring core assembling machine, with a device for varying the mutual spacings of the wire springs, the springs being held by gripper arms which are mounted side by side on a gripper beam, in which a first gripper arm is fixedly connected to the gripper beam while all the other gripper arms are mounted in a laterally movable manner on the gripper beam, the gripper arm furthest from the first gripper arm being connected to a drive member which permits movement of the latter gripper arm on the gripper beam, and wherein each gripper arm is releasably connected to the adjacent gripper

arm by means of a distance limiting member with two end stops, so that any one gripper arm can be adjusted to two different spacings, limited by the end stops, relative to the adjacent gripper arm.

2. Apparatus according to claim 1, in which a double acting lifting cylinder is provided as the drive means, which connects the first gripper arm to the gripper arm located furthest from it.

3. Apparatus according to claim 1, in which a bolt is provided between two adjacent gripper arms as the distance limiting member, and is fixedly anchored in one gripper arm and passes with clearance through the adjacent gripper arm, whilst the two end stops are adjustably mounted on each side of the latter gripper arm.

4. Apparatus for feeding a plurality of wire springs to a spring core assembling machine, substantially as herein described with reference to the accompanying drawings.

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